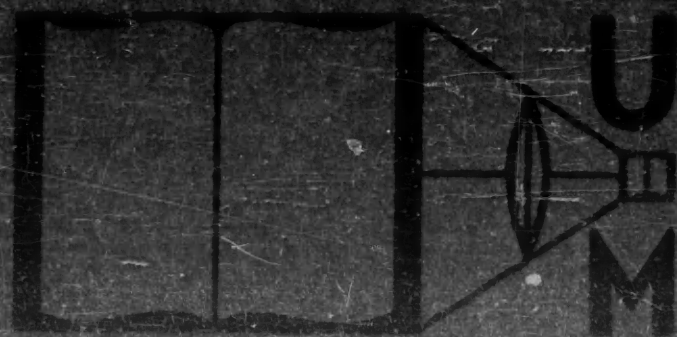


Vol. II

No. 1

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M I C R O F I L M
A B S T R A C T S

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CONTENTS

	Page
INTRODUCTION	vii

CHEMISTRY

A STUDY OF THE KINETICS OF THE REACTION BETWEEN TRICHLOROACETIC ACID AND TRIMETHYLETHYLENE IN THE LIQUID PHASE	1
Charles Richard Clark	
A STUDY OF THE VAPORIZATION OF LIQUIDS INTO A GAS STREAM	3
George Walter Eckert	
THE REACTION OF FREE RADICALS WITH SILVER SALTS	5
Howard Paul Hetzner	
THE COMPARATIVE STABILITY OF ARYLCHLOROMETHANES	7
Eugene B. Reid	
A STUDY OF THE FACTORS INFLUENCING THE DETOXICATION OF SELENIUM IN THE ANIMAL BODY .	10
Julius Schultz	
COMPARATIVE TOXICITY OF SELENIUM IN THE PRESENCE OF VARIOUS SULFUR COMPOUNDS	12
Bertis Alfred Westfall	

ECONOMICS

EXPERIMENTALISM IN ECONOMICS	14
August Maffry	

EDUCATION

STATUS OF SENIOR HIGH SCHOOL PROMOTION PLANS	16
J. F. Montague	

EDUCATION

- CERTIFICATION OF TEACHERS IN MISSOURI . . . 18
Carl Leslie Parker

- THE LOCATION OF PUBLIC JUNIOR COLLEGES IN
MISSOURI 20
William Knox Summitt

- A CONTINUOUS TEACHER ACCOUNTING SYSTEM FOR
MISSOURI 24
Clyde William Taylor

HISTORY

- SECULAR ASPECTS OF THE ENGLISH EPISCOPATE IN
THE REIGNS OF HENRY III (1216-1272) AND
EDWARD I (1272-1307) 27
Louis William Doll

- THE BRITISH WEST INDIES IN ECLIPSE, 1838-
1902 29
Homer Carroll Huitt

MATHEMATICS

- CHARTS AND TABLES FOR PREDICTION IN PSYCHOL-
OGY AND EDUCATION 31
Harold D. Griffin

PHILOLOGY

- CONCORD OF NUMBER IN MODERN ENGLISH WITH SPE-
CIAL REFERENCE TO THE INDEFINITES 33
Florence Gray Beall

POLITICAL SCIENCE

- COUNCIL-MANAGER GOVERNMENT IN KANSAS CITY . 35
Henry Macmillan Alexander

PSYCHOLOGY

SYMMETRY AND ASYMMETRY IN FORM ABSTRACTION
BY CHILDREN 37
Charles H. Crudden

FORM DISCRIMINATION AS A LEARNING CUE IN
INFANTS 39
Bing-chung Ling

SOCIOLOGY

AN EDUCATIONAL SURVEY OF THE STATE INDUSTRIAL
HOME FOR GIRLS IN MISSOURI AT CHILLICOTHE . . 40
Anna Verona Burns

THE SOCIAL PROBLEMS IN THE WRITINGS OF RENÉ
BAZIN 43
Nan E. Wade

CUMULATIVE INDEX 47

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

REPORT OF THE

COMMISSIONERS OF THE

BOARD OF EDUCATION

FOR THE YEAR

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INTRODUCTION

This second volume of MICROFILM ABSTRACTS represents a further effort to provide an effective means of publication for doctoral dissertations.

One sometimes loses sight of the fact that merely the ability or willingness to furnish a copy of a book or manuscript on paper or on microfilm does not in itself constitute publication, for the publishing process involves a counterpart to production and distribution, that of adequate and sufficient notice to the prospective user, of the nature and contents of what is offered. When these two functions are both properly completed, publication is fully a fact whether the copies offered be printed on paper or on microfilm. Therefore, the primary purpose of this booklet is to describe those doctoral theses which are available in film form, as completely as possible, so that the prospective user may order with confidence that the material will meet his needs.

Because no copies have been made up for stock, as is the case with ordinary publishing methods, the only expense of microfilm publication is that of notification, which it would seem can best be done by a carefully prepared and approved abstract, distributed to scholarly journals and important research libraries. The total cost of publication of any of the manuscripts described in MICROFILM ABSTRACTS is \$15.00, while a positive microfilm copy of the complete original manuscript may be had at the rates quoted at the end of each abstract, to be paid by the user.

Acceptance of microfilm publication is growing, as evidenced by the fact that since the appearance of Vol. I of MICROFILM ABSTRACTS, eight schools

have approved publication in this way, as meeting the requirements for the degree. Not all of these eight are represented in this issue, since in some cases approval came too late to have abstracts printed in this issue, but will appear in a later one.

In order that each issue of MICROFILM ABSTRACTS may be of greatest use, a CUMULATIVE INDEX has been added at the back, in which are listed by title, all the theses available on microfilm. Some of the titles have been described in a preceding issue of MICROFILM ABSTRACTS. Others have been described in volumes of abstracts published by the school granting the degree, the administration of which recognizes the value of combining such abstract publication with facilities whereby the complete manuscript is available in some usable form to those who want it. In all cases a positive microfilm copy may be secured from UNIVERSITY MICROFILMS at 1 $\frac{1}{4}$ ¢ per page.

The effectiveness of microfilm publication, however, is directly proportional to the usefulness and availability of reading machines. Although the number of reading machines in use is constantly increasing, and has already reached considerable proportions--estimates varying from 1500 to 2500 in the United States--there are none the less many scholars who either, through lack of facilities or personal preference, cannot or will not use microfilm, and any system of microfilm publication must take this group into consideration.

Accordingly, copies of theses listed in this booklet are available in paper print form, 6" x 8", at a cost of six (6) cents per page. While this figure is considerably above normal book rates, the fact that the total demand for doctoral theses is limited at best, the total expenditure of the available funds of scholarship will be much less for publication in this way than if published through the usual channels of type and paper.

Properly applied, the principles of microfilm publication can solve many of the perplexing

publishing problems facing us today. If there is a market for but one copy, that market may be served, and scholarship freed from the iron grasp of the printing press which for generations has forced mass publication of specialized materials.

CHEMISTRY

A STUDY OF THE KINETICS OF THE REACTION BETWEEN TRICHLOROACETIC ACID AND TRIMETHYLETHYLENE IN THE LIQUID PHASE

Charles Richard Clark, Thesis (Ph.D.)
University of Missouri, 1937

This reaction is interesting because it is autocatalytic. Nernst and Hohman (Z. Phys. Chem. 11, 352 (1893)) assert that the catalytic activity of the acid varies from the second power of its concentration at 100° C. to the sixth power at 30° C. This is not confirmed. It is found that, in the absence of "associating" solvents the catalytic activity of the acid varies as the square of the concentration, whereas in "associating" solvents it varies as the cube of the concentration. Data are treated from the point of view of Absolute Reaction Rate Theory. The activated complex in non-associating solvents thus contains two molecules of acid in addition to the reacting molecule and in associating solvents the complex contains three of these extra molecules. It may have on the average one single and one double (associated) acid molecule. The activated complex is strongly polar, more so than the acid itself and much more so than the ester. This is witnessed by the fact that even in solvents in which the acid is not associated two extra molecules are "frozen out" onto the activated complex.

The effect of acetone on the reaction is very interesting. In pure acetone the reaction proceeds, if at all, with a velocity too slow to measure. Small amounts of acetone added to the pure reacting system amylene--trichloroacetic acid not only retard the velocity of esterification but shift the equilibrium

away from ester formation. In this sense, while affecting the reaction velocity, acetone is not a true catalyst. The true catalyst is generally considered to be a substance which has no influence on the equilibrium between reactants and reaction products but which, from the point of view of absolute reaction rate theory, will shift the equilibrium between reactant and activated complex either toward the increased concentration of this latter complex, with resulting positive catalytic effect, or in the opposite direction, with resulting negative catalytic effect. In the present instance it happens that acetone shifts both equilibria, and thus affects both the extent to which the reaction will proceed and the velocity with which the final thermodynamic equilibrium is reached.

Publication Number 138

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A STUDY OF THE VAPORIZATION OF LIQUIDS
INTO A GAS STREAM

George Walter Eckert, Thesis (Ph.D.)
University of Missouri, 1936

Rates of evaporation were studied for the case in which the surface of a liquid was exposed to a current of air directed vertically down onto it. This work differs from most previous work in that interest has been centered on speed of apparent saturation of the air space with vapor. Since the actual uni-directional rate of evaporation is always extremely great compared to the net rate experimentally determinable, the general problem of evaporation would seem naturally analyzable into diffusion velocities and convection effects. With properly designed experiments it is possible to largely reduce the diffusion factor and permit nearly saturated gas to carry away the evaporating liquid by convection. The present study deals with experiments of this type. The factors which were investigated included the rate of air flow, the size of the air inlet tube, and the distance of the air inlet from the surface of the liquid. Initial temperature and surface area were the same in all runs. The air was pre-adjusted to this temperature and directed into the vaporization chamber perpendicularly to the surface of the liquid. The data all point to evaporation, for low air velocities, through a stationary film of air as previously postulated for the particular case of water evaporation by Lewis (Am. Soc. Mech. Engineering 44, 445 (1922)). Such an effective film seems present in the case of all liquids studied. It insulates the surface of the liquid from the main body of air, but is not held firmly and can be displaced to a varying degree by directing an air current onto the surface at varying velocities. This film disruption permits increased evaporation directly into the moving gas with

less diffusion through the stationary film. The stability of this stationary film as measured by the air velocity necessary to disrupt it, is found to vary from one liquid to another. It was found that, at air velocities sufficient to displace the stationary layer, there is a velocity range through which the air emerges practically saturated with vapor (98 to 99%) for liquids of saturation pressures sufficiently low that evaporation heat losses do not disturb the surface temperature appreciably. The same is probably true in all cases if we take into account varying surface temperature. Through such a range of air velocities, and only through this range, it will be seen that evaporation rate will be a linear function of rate of air flow.

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THE REACTION OF FREE RADICALS WITH SILVER SALTS

Howard Paul Hetzner, Thesis (Ph.D.)

University of Michigan, 1939

Several properties of free radicals of the triarylmethyl series indicate a striking relationship between these compounds and certain metals in their elementary state. The present investigation of the reduction of metal salts to the free metal or to a lower valence state by triarylmethyl radicals offers further evidence of the metal-like nature of the radicals.

Our primary interest was an investigation of the possible use of certain of these reactions for the quantitative determination of the purity of hexaarylethanes which, by dissociation, give rise to triarylmethyl radicals. Limitations of the methods previously used for such quantitative determinations are briefly discussed.

It has been established that reaction of a number of silver salts with triphenylmethyl results in the formation of metallic silver and the corresponding triphenylmethyl ester. These reductions are apparently quantitative. We now find,--the results of analysis for the purity of triphenylmethyl by estimation of the metallic silver liberated from an excess of silver salt are the same as the results which are obtained by iodine titration according to Ziegler's procedure. A discrepancy between the results by these two methods on the one hand, and by the classical method of oxygen absorption on the other hand, is, in our opinion, attributable to errors inherent in the latter method.

Quantitative reduction of silver salts is characteristic only of those ethanes which are at least as highly dissociated as hexaphenylethane. In addition, the bi-radical *p,p'*-biphenylene-bis-(diphenylmethyl) was found to reduce, rapidly and quantitatively, a number of silver salts.

Of the various silver salts, only silver perchlorate, dissolved in toluene or benzene, is reduced at room temperature by very slightly dissociated ethanes. Thus, the reduction of silver perchlorate to metallic silver affords a convenient and sensitive qualitative test for the presence of free radicals in very slight concentrations. Moreover, comparison of the relative rates of reduction provides a means of distinguishing the dissociation tendencies of slightly dissociated ethanes.

In connection with this work, a new method for the synthesis of slightly dissociated symmetrical ethanes has been applied in the preparation of the 9,9'-diaryldifluoryls, and a number of new triaryl-methyl derivatives are described.

Publication Number 100

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THE COMPARATIVE STABILITY OF ARYLCHLOROMETHANES

Eugene B. Reid, Thesis (Ph.D.)
University of Michigan, 1939

The free energy of formation of an arylchloromethane from its carbinol and hydrogen chloride has been employed as the criterion of the stability of the arylchloromethane with respect to its carbinol. The stabilities of the following chloromethanes have been measured: Benzyl chloride, p-xylyl chloride, diphenylchloromethane, p-methyldiphenylchloromethane, m-methyldiphenylchloromethane, o-methyldiphenylchloromethane, p,p'-dimethyldiphenylchloromethane, o,o'-dimethyldiphenylchloromethane, p-chlorodiphenylchloromethane, o-chlorodiphenylchloromethane, p,p'-dichlorodiphenylchloromethane, p-phenyldiphenylchloromethane, triphenylchloromethane, and tri-p-tolylchloromethane.

A dilute benzene solution of the carbinol or chloromethane was equilibrated at 60° C. with an aqueous layer of hydrochloric acid of such concentration that the final amounts of carbinol and chloromethane were about equal. The chloromethane in the equilibrium mixture was determined by adding excess standard alcoholic silver nitrate and back-titrating potentiometrically with sodium chloride. The carbinol was obtained by difference. The concentration of the aqueous hydrochloric acid was determined by a sodium hydroxide titration. The liquid phase equilibrium constant was expressed in terms of the concentrations of the carbinol and chloromethane, and the partial pressures of water and hydrogen chloride.

In order to eliminate solvent and intermolecular effects the gas phase constant was desired. It was more practical to transfer the liquid phase constant to the gas phase with vapor pressure data than to carry out the reaction in the vapor state. The arylchloromethanes form nearly perfect solutions with benzene so their partial pressures were calculated directly from the vapor pressures of the pure

compounds by the expression $p = P^0 N$. The benzene-carbinol solutions are imperfect; but the partial pressure of benzene may be made to follow Raoult's law if an arbitrary mole fraction of the form

$$X_2 = \frac{m_2}{A m_1 + m_2} \text{ be used;}$$

where A is a constant and m_2 and m_1 are the numbers of moles of carbinol and benzene. It was shown that the partial pressure of the carbinol is related to the mole fraction in the fashion

$$p = P^0 X^{\frac{1}{A}}$$

which in very dilute solution reduces to

$$p = P^0 \left(\frac{N}{A} \right)^{\frac{1}{A}}$$

where N is the true mole fraction. Upon substitution of the partial pressure expressions for the carbinol and chloride in the gas phase equilibrium constant, it reduces to

$$K(g) = \frac{P_{\text{RCl}} \times P_{\text{H}_2\text{O}}}{P_{\text{ROH}} \times P_{\text{HCl}}} = K(lig) \frac{P_{\text{RCl}}^0}{P_{\text{ROH}}^0} \frac{1}{A} \frac{1}{N_{\text{ROH}}} \frac{1}{A}.$$

The necessary vapor pressure data for the transfer to the vapor phase were measured for the benzyl alcohol-chloride, *p*-xylyl alcohol-chloride, diphenylcarbinol-chloromethane, and *p,p'*-dimethyldiphenylcarbinol-chloromethane systems. For the remaining systems part of these data were estimated.

The free energy of the gaseous reaction was obtained by employing the relation

$$\Delta F = -RT \ln K(g).$$

The modification in type of compound, i.e., from primary through secondary to tertiary, has the more marked effect upon the free energy change. Substitutions on the phenyl rings produce only minor variations. The stability with respect to the carbinols of the arylchloromethanes increases in the order of triphenylchloromethane, diphenylchloromethane, and benzyl chloride.

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A STUDY OF THE FACTORS INFLUENCING THE
DETOXICATION OF SELENIUM IN THE ANIMAL BODY

Julius Schultz, Thesis (Ph.D.)
University of Michigan, 1939

It has been previously reported that when methionine is added to the diet of white rats fed selenium (as sodium selenite) at a level of 35 p.p.m., the rats show better growth and live longer than rats receiving selenium without methionine supplements. The addition of cystine in place of methionine to the same diets failed to influence either the growth or longevity of these rats.

The present investigation has confirmed these results with diets containing higher levels of selenium (50 p.p.m.) and with diets containing arachin, a protein low in its content of methionine, as a source of protein in place of casein which was used in the earlier experiments.

Reports of microscopic examination of the livers of rats poisoned with selenium indicated a large incidence of fatty degeneration and fatty infiltration which varied with the cystine, casein and methionine content of the diet. Chemical analysis of the livers of approximately 150 rats in chronic and acute selenium intoxication failed to show marked fatty changes suggested by microscopic examination. The effect of methionine on the total lipids of the liver of selenium poisoned rats is discussed.

A critical review of the literature has not afforded adequate evidence for the belief that selenium is detoxicated and excreted as dimethyl selenide. An apparatus was designed for the quantitative study of the excretion of volatile selenium compounds exhaled by selenium poisoned rats. It was found that rats thus excreted through the lungs from 28 to 50 per cent of the amount of selenium injected. Various

factors which may influence the magnitude of this excretion were studied.

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COMPARATIVE TOXICITY OF SELENIUM IN THE
PRESENCE OF VARIOUS SULFUR COMPOUNDS

Bertis Alfred Westfall, Thesis (Ph.D.)
University of Missouri, 1938

Some of the relations of sulfur to selenium activity in the living animal were considered. A single injection of 0.7 p.p.m. of sodium selenite in 0.1 cc. of 0.85 per cent NaCl solution into the air cell of hens' eggs immediately before incubation produced an average mortality of approximately 50 per cent of the developing chicks. Of the embryos surviving about 25 per cent in terms of the total number of fertile eggs were deformed. These monsters were characterized by abnormal upper bills varying in degree from slightly shorter than normal to complete absence. A disturbance of the eye was associated with the bill deformity in nearly every case, showing a gradation of abnormality from an almost imperceptible effect to a total lack of either or both eyes. This dose of sodium selenite, 0.7 p.p.m., was used as the standard in bioassay tests. Glutathione injected with the sodium selenite in an atomic Se:S ratio of 1:2 or 1:5 greatly reduced the mortality produced by the selenite and prevented the formation of deformed embryos. The monosulfide of sodium injected with the sodium selenite in atomic Se:S ratio of 1:2, 1:5 and 1:8 also reduced the mortality due to selenium and prevented the formation of deformed embryos. Sodium sulfate also reduced the mortality produced by sodium selenite. However, sodium sulfite did not protect against the toxic action of sodium selenite when injected into hens' eggs.

Sodium sulfide injections did not mitigate the toxic action of sodium selenite in day-old baby chicks. Independent intravenous injections of sodium sulfide gave no protection against selenium poisoning in dogs. Injections of a mixture of sodium sulfide

gave no protection against selenium poisoning in dogs. Injections of a mixture of sodium selenite and sodium sulfide in an atomic ratio of 1:10.8 doubled the toxicity of the contained selenium for dogs. However, injections of a selenium-sulfur suspension produced by mixing sodium selenite and sodium sulfide in an atomic Se:S ratio of 1:0.4 were much less toxic to dogs than the same quantity injected separately. Sulfur compounds injected into dogs did not prevent the increase in permeability of the lung tissue and the resultant pulmonary edema of acute selenium poisoning. Injections of selenium in the precipitated form produced very little change in permeability of the lung tissue in dogs as indicated by the very small amount of edema following such injections.

The data do not indicate any specific antidotal action of sulfur against selenium, and do not support the belief that selenium accomplishes a direct substitution for sulfur or vice versa. The protective action of sulfur compounds against sodium selenite seems to be associated with some basic cellular or metabolic activity.

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ECONOMICS

EXPERIMENTALISM IN ECONOMICS

August Maffry, Thesis (Ph.D.)
University of Missouri, 1930

The principal divisions of thought in the field of economics are identified, in methodological terms, as the qualitative school, the quantitative school, and the historical or institutional school. An examination of the conclusions reached by representatives of each group indicates that the disparity of economic doctrines inheres in differences in methods, techniques, and points of view. The choice among procedures which yield conflicting theories with respect to similar or identical aspects of economic life poses itself as a concrete problem.

If a workable definition of scientific truth can be established, it becomes possible to test, with reference to a definite criterion, the results obtained by the employment of various methods. It is considered axiomatic that economic theory must accord with the facts of economic life. Any theory, proposition, or generalization is true if it is in agreement with experience, if it is confirmed and verified by observation, if it receives the support of the relevant facts.

This experimental truth is the standard of validity in the physical and biological sciences. As new facts are brought to bear upon theories, they are revised, remodeled, or discarded in their entirety, according as the facts warrant. The generalizing of a body of facts has been followed in all the sciences by attempts at verification and by the attendant perception of errors in the formulations under examination

as well as of additional facts bearing upon them. These discoveries have then led to a restatement of existing doctrines in more accurate form which have at the same time comprehended larger bodies of facts. The process of correction, revision, and reformulation has continued until the establishment of our present body of knowledge, which is, in turn, undergoing steady criticism and continual revision.

The progress of theories in the social fields has been no different, on the whole, from that of theories in the physical sciences. There is even less hope for the establishment of a body of social theory which will long remain intact than for the setting up of a permanent body of knowledge of physical relationships. The changing social structure will undermine any generalizations made with reference to a given social situation. It is not surprising that disagreement should arise between one theorist whose attention has been devoted chiefly to a past or passing situation and another whose efforts are devoted mainly to the description of a new and materially different situation.

A detailed survey of the methodological schools in the light of experimental norms leads neither to wholesale condemnation nor to wholesale praise of the practices of any group of economists. A comparison of the procedures of each with experimental standards and the selection of techniques which promise experimental results lays the groundwork for outlining a synthetic methodology which is rigorously experimental. The qualitative economist's predilection for a system, the historical economist's insistence upon induction and genetics, and the quantitative economist's faith in statistical measurement can be welded into a unified methodological tool to serve the modern-day economist in attacking his multifarious problems.

Publication Number 142

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EDUCATION

STATUS OF SENIOR HIGH SCHOOL PROMOTION PLANS

J. F. Montague, Thesis (Ph.D.)
University of Missouri, 1926

This investigation was undertaken to ascertain the status of promotion plans, in secondary schools, throughout the United States. No attempt was made to evaluate specific plans; or to establish direct causes of pupil elimination and retardation, but rather to show actual conditions and the relationship between promotion plans used and the percentage of pupil failures, courses dropped and leaving school.

Promotion plans were described as administrative devices to minimize the problems resulting from mass instruction for pupils of widely different capacities, interests, aptitudes, and experiences.

In order to establish current practices, approximately 2500 questionnaires were forwarded from the Bureau of Education over the signature of John J. Tigert, then the United States Commissioner of Education, to the superintendents of schools in all cities of the United States reporting a population of 2500 or more. Replies were obtained from 838 superintendents and principals representing each of the 48 states and the District of Columbia. From the 838 replies obtained it was possible to select the most complete reports on 334 high schools representing 199,130 pupils in 42 states and the District of Columbia. For purposes of comparison, reports were again divided into three classes of schools on a basis of enrollment. All reports were made from actual school records.

Improved classification and instructional plans, which aimed at individual assistance, required slightly more teachers but reduced losses from retardation through failures, courses dropped, and pupils leaving school. The effectiveness of promotion plans, in retaining pupils in school and keeping them moving forward regularly through the grades depends upon two things: (1) obtaining an accurate educational status of pupil entrants and utilizing that knowledge in affecting the necessary adjustments through counsel and guidance for proper development; (2) a scientific administration of the plan used.

In the administration of plans, two types of adjustment are receiving much emphasis in current practice: (1) adjusting the plan of organization without breaking away from the basic class organization; (2) providing for individual progress in the common essentials through greater individualization of work.

The first plan goes little beyond requirements for economical participation in group instruction and the right of each pupil to carry the load of a theoretically average pupil. The second plan recognizes the rights of individual pupils to progress upon effort and social achievement rather than upon purely objective and academic requirements in subject matter. Thus the school has begun to accept its share of the responsibility for the pupil's failure to succeed in the type of work provided. The statistics gathered in this study revived the thought that continued public support of our system of secondary education may demand that we provide an equal number of years of training for all pupils, who come to us, regardless of their particular abilities.

Publication Number 143

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CERTIFICATION OF TEACHERS IN MISSOURI

Carl Leslie Parker, Thesis (Ph.D.)

University of Missouri, 1936

This investigation, presented from a developmental point of view, provides an understanding of present conditions through a carefully prepared statistical study and makes practical suggestions for improvement of certification methods and practices.

The origin and development of certification of teachers in Missouri are shown through a study of legislative enactments; session laws; court decisions; rules, regulations and reports of the state superintendent of schools; and, official publications of the State University and State Teachers Colleges.

Conditions existing under the present plan for certification are revealed through a study of such factors as training, experience, tenure, salary, size of school and pupil-teacher ratio. Relationships existing between these variabilities are shown in terms of correlation coefficients and correlation ratios. These factors are also shown in relation to the type of certificate held and the type of work being done by the teacher holding the certificate. The teachers studied, 16,999, represent 90.3 per cent of all white teachers employed in the public schools of the State for 1934-1935, exclusive of St. Louis, St. Joseph and Kansas City. All factual data presented are taken from original records. Where data were submitted by county superintendents of schools, they were taken from official records and the official in office certified to their correctness.

Trends in certification of teachers by the various agencies, state department of education, state schools and county, are shown in number and percentage of certificates issued. Specialization of teaching is revealed by a study of the training and duties of high school teachers and administrators,

showing the extent to which teachers work in the field of their major interest and supplying some data regarding the types of teacher training demanded by the State. Average training, experience, tenure and salary of each specialized group is tabulated to show conditions and facilitate comparisons. These same factors were studied for all teachers according to type of certificate held and type of teaching service offered. The majority of low-grade certificates are held by rural school teachers. These teachers are, likewise, found to have the least training, least teaching experience, lowest tenure and to receive the smallest salaries. Elementary and high school teachers respectively hold more favored ratings in these measures. Great variation, however, is found in the salaries paid in the various subject matter fields.

There is a slight tendency for public school teachers in Missouri to be paid in proportion to their training, teaching experience and pupil load. This indicates that the value of training and experience is recognized by the public and school administrators. Furthermore, when teachers are given increased teaching responsibilities, they tend to receive additional salaries. A tendency is also found for the larger schools to employ the better trained teachers, who are more experienced, at the better salaries. Specific recommendations are made for revision of the present plan for certification to the end that teaching will become more professionalized and the present and future educational needs of the State will be more nearly met.

Publication Number 141

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THE LOCATION OF PUBLIC JUNIOR COLLEGES IN MISSOURI

William Knox Summitt, Thesis (Ph.D.)
University of Missouri, 1933

Statement of Problem

The purpose of this study is to formulate criteria which might be used to determine the feasibility of establishing a public junior college in a particular locality, and to apply the criteria thus formulated to certain localities in Missouri to determine the feasibility of establishing public junior colleges in these localities.

Sources of Data

The data were collected from printed reports, published literature in the junior college field, official records and reports, and administrative surveys of the public schools in the several counties in Missouri.

Methods of Securing Data

Data for this study were secured by the following methods:

1. Compiled from printed reports, official records, and published literature in the field.
2. Personal conferences supplemented by the information blank.
3. Questionnaire.
4. Careful comprehensive surveys of the educational systems in the several counties in Missouri.

Derivation of Criteria

It seemed best to use the results of research previously made and the opinions of specialists in the field of junior college administration as described in the literature as the most scientific standards for judging the ability of a community or district to successfully operate a public junior college.

The consensus of opinions relative to the numerical size of the definite factors considered is compared with and supported by a study of the central tendencies in the size of the factors under consideration in actual situations in the United States and in Missouri. The central tendency used in this study is the mean.

Summary

It is recommended that the following criteria be used:

1. The minimum enrollment in a public junior college should be at least 150 students regularly enrolled.
2. The local district should have at least 900 students regularly enrolled in grades nine to twelve, or the county in which the local district is located should have at least 1500 students regularly enrolled in grades nine to twelve, including those enrolled in the local high school.
3. The local district should be able to provide at least 160 high school graduates annually or the county in which the local district is located should be able to provide at least 250 high school graduates annually, including graduates of the local high school.
4. The total white school enumeration in the district should be approximately 5500 children or the total white school enumeration in the county

should be approximately 10,500 children between the ages of six and twenty years, including the enumeration in the local district.

5. The total population of the district should be at least 19,000 inhabitants or the county in which the district is located should be at least 40,000 inhabitants, including the population of the local district.
6. The proposed public junior college should not be established in a county in which is already located a public junior college which is adequately providing for the higher educational needs of the county.
7. The proposed public junior college should not be established in any of the counties in which a State Teachers College is now located.
8. The proposed public junior college should not be established in either of the counties in which are located the University of Missouri or the Missouri School of Mines and Metallurgy.
9. The proposed public junior college should not be established in a county in which is located a private college which is adequately serving the higher educational needs of the county.
10. The area of the proposed public junior college district should not be larger than the county if the conditions in the county fully meet the criteria which have been formulated for the establishment of a public junior college within a county. The public junior college district may consist of a joint-district of two or more counties.
11. The elementary and high schools in the proposed junior college district should be as good or better than the average for the state as a whole.
12. There should be an all-weather road from each high school center in the proposed public junior college district to the proposed center of the public junior college district.
13. The proposed public junior college district should be approved by the State Department of Education.

Application of Criteria to Particular Situations

The criteria formulated to determine the feasibility of establishing a public junior college in a particular locality were applied to twenty-one Missouri counties. As measured by these criteria only two of the twenty-one counties meet the criteria sufficiently well to justify the establishment of public junior colleges within the counties.

The criteria were applied to four adjacent Missouri counties to determine the feasibility of establishing a joint-county public junior college district comprising the four counties. As measured by these criteria the conditions in the four counties meet the criteria sufficiently well to justify the establishment of a joint-county public junior college district comprising all the territory now within the boundaries of the four counties.

Publication Number 140.

. Microfilm copy of complete manuscript 324 pages
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A CONTINUOUS TEACHER ACCOUNTING SYSTEM
FOR MISSOURI

Clyde William Taylor, Thesis (Ph.D.)
University of Missouri, 1932

Purpose

To develop a system of teacher accounting records for Missouri that will make possible (1) a more efficient administration of the teachers' certificate laws of the State, (2) a more accurate determination of the supply of teachers in the State, and (3) a better placement of teachers in the public schools of the State.

The proposed system of records is intended to provide the essential record and report forms for collecting information needed for the issuance and renewal of certificates to teach in the public schools of Missouri.

Since the problem of teacher supply and demand is of vital interest to school people both in Missouri and in other states, provision for continual studies of supply and demand for teachers in Missouri appears necessary for the future progress of the public schools of the State. Therefore, the proposed record system is also intended to furnish the forms necessary for collecting data about the supply of teachers in Missouri that should make possible continual studies of teacher supply and demand.

There is no central office in Missouri to which school boards and superintendents may look when seeking teachers who are trained for particular positions. The proposed system of records, if installed by the State Department of Education, is likewise intended to supply much information about individual teachers of Missouri that will make possible more efficient placement of teachers in the public schools.

Scientific Approach

Data and information used in the study were gathered largely from the following sources: teacher accounting forms submitted by state departments of education, institutions of higher learning in Missouri, city school systems, and teachers' agencies; forms and recommendations used by the United States Office of Education; forms and standards of the North Central Association of Colleges and Secondary Schools; the Missouri Constitution and Statutes; studies pertaining to the problem; and textbooks on school administration.

Summary

- (1) A set of criteria was developed for constructing a system of teacher accounting for Missouri.
- (2) A system of teacher accounting records was constructed on the basis of the above-mentioned criteria.
- (3) A list of procedures in administering the foregoing system of teacher accounting records was proposed.

Recommendations

- (1) A system of teacher accounting records should be installed by the State Department of Education.
- (2) The State Department of Education should have a director of teacher-training and placement.
- (3) The state director should limit the issuance of certificates by county superintendents of schools.
- (4) Only the most capable students should receive the high school teacher training certificates.
- (5) Adequate uniform teacher accounting records should be developed for use by county superintendents of schools in Missouri.

- (6) Adequate teacher personnel record forms should be developed for use in city, town, and consolidated districts.

Publication Number 107

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HISTORY

SECULAR ASPECTS OF THE ENGLISH EPISCOPATE IN THE REIGNS OF HENRY III (1216-1272) AND EDWARD I (1272-1307)

Louis William Doll, Thesis (Ph.D.)
University of Michigan, 1937

This thesis is a study of two related topics, first of the episcopal temporalities such as castles, manors, and jurisdictions; and of the non-spiritual activities of the episcopate resulting partly from these possessions and partly from other causes. The period from 1216 to 1307 was chosen because of the great amount of material available, private documents as well as government rolls. The period also covers the rise of clerical taxation, especially the assessments of 1254 and of 1291, as well as the inquest of hundreds in 1274 and the quo warranto proceedings beginning after the statute of Gloucester in 1278.

Of primary interest are the possessions with which the bishop was enfeoffed after his election, the bishop's barony. Unlike a lay barony it went, at the death of the holder, to his successor and not to his heir. Much information about the barony can be obtained from the pipe rolls, for the barony sede vacante was in the hands of royal custodians who accounted at the exchequer at the end of their custodianship. For the most part the barony was held by knight service, but as the episcopal possessions grew in number, the barony became a miscellaneous collection of rights held by various tenures and under various conditions.

Among the possessions making up the barony were tangibles ranging from large territorial

jurisdictions like the county of Durham in the possession of the bishop of Durham to hundreds, seaports, boroughs, manors, castles, villis, and hamlets. Among the more usual intangible rights were those of sac and soc, toll and team, infangthef and utfangthef, frankpledge, return of writs, and free warren. The episcopate had many exemptions and obtained many for their tenants, like the right to be quit of suit at county or hundred courts, disafforestation, and freedom from service on juries and recognitions. The archbishops of Canterbury and York and the bishop of Durham had a limited right of coinage.

During the period from 1216 to 1272 the episcopate was very influential, especially while King Henry III was a minor. There were no major offices and few minor ones that Henry had not at one time or other conferred on a member of the episcopate. During the baronial rebellions, considerable use was made of the power of excommunication, and resort was often made to archbishops or bishops for arbitration of disputes. The infrequency with which Edward I employed the episcopate is in marked contrast to the policy of his predecessor.

Publication Number 108

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THE BRITISH WEST INDIES IN ECLIPSE, 1838-1902

Homer Carroll Huitt, Thesis (Ph.D.)

University of Missouri, 1937

The British West Indies as defined in this study include the following: Bahamas, Barbados, Jamaica, Leeward Islands, Trinidad and Tobago, and Windward Islands.

These islands, after a long period of economic decline beginning in the eighteenth century, were given what almost amounted to a death blow by the emancipation of their slaves in 1838.

Slave emancipation led to serious economic as well as social disorganization. Labor shortage resulted when the slaves refused to work, even for wages. Various attempts were made to solve the problem by transporting indentured laborers from Africa, India, China, and various other places. This policy, which was continued until almost the close of the nineteenth century, was regarded by the West Indian colonies and the British government as only partially successful.

The coming of large numbers of ignorant indentured laborers added to the social confusion brought on by emancipation. Health and sanitary conditions were especially bad. General ignorance, due largely to lack of popular education, created serious moral problems.

The sugar industry, main source of West Indian income, was seriously hit by the labor shortage. Gradually, however, with the help of prohibitory tariffs levied by the United Kingdom against slave-grown sugar, the colonies began to rebuild their industry on the basis of free labor. But, unfortunately, other problems soon cast a gloom on the sugar raisers. In the first place, handicapped by debt, obsolete machinery, and improper methods of cultivation and manufacture, they were in no condition to compete with

rivals in other parts of the world. The sugar islands felt that the crowning blow was struck when Parliament in 1846 passed an act providing for gradual abolition of the protective duty. The effect on the West Indian sugar industry was disastrous.

But this was not all. Sugar prices constantly fell. Moreover, foreign competition grew more intense. Meantime, a more serious difficulty had arisen, the production of beet sugar by the bounty system. This practice, beginning during the Napoleonic wars, grew very popular in Europe by the middle of the nineteenth century. From then until the close of the century, the British West Indies constantly fought for repeal of the bounties. This was finally accomplished in 1902.

As might be expected, the islands were also harassed during this period by financial difficulties. Confusion in currency, public as well as private debts, and unbalanced budgets were constant sources of trouble. As a result, the British government was continually being called upon for grants-in-aid, loans, and subsidies for the various colonies.

In spite of this dependence on the mother country, the British West Indies, commercially, were gradually turning to other countries, especially to the United States.

As the sugar industry declined, the islands turned more and more to other agricultural pursuits. While at the end of the century sugar was still the main industry, fruit, cocoa, and other products were generally gaining greater relative importance. This resulted in some improvement, and by 1902 it seemed probable that a happier era had dawned for these once prosperous British possessions.

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MATHEMATICS

CHARTS AND TABLES FOR PREDICTION IN PSYCHOLOGY AND EDUCATION

Harold D. Griffin, Thesis (Ph.D.)
University of Missouri, 1929

This study presents a simplified, easily followed, adequately checked, and unified procedure for obtaining the linear regression equations used in prediction. The procedure is carefully charted from the assembling of the initial data, the correlating of these data for any number of variables, to the preparation and solution of the simultaneous linear equations used in obtaining the partial regression coefficients, to the methods used in obtaining the multiple correlation coefficient, to the calculation of the regression coefficients and the regression equation, and, finally, to prediction by means of the regression equation.

The procedure includes (a) a zero-order correlation form adjustable to any number of variables; (b) a multiple correlation form which follows the Doolittle method of solution, and is also adjustable for any number of variables; (c) certain special procedures associated with prediction, such as testing for linearity, the correlation ratio, the reliability coefficient, correction for attenuation, correlating ranked data, converting ranked data for prediction, converting test scores into comparable series, and partial correlation; and (d) nomographs and calculating tables to facilitate computations.

These nomographs and tables constitute the major contribution of this study, and only those have been included which may be of value in prediction.

Each of the nomographs may be considered as a form of the slide rule, constructed for one specific purpose, and requiring no mental adjusting of the decimal point. Furthermore, directions are furnished that will enable the reader to construct his own simple nomographs. The calculating tables have also been carefully selected. With their aid the procedures outlined in the study may be adjusted to machine, slide rule, or logarithmic solution.

Prediction, when once the regression equation has been obtained, is facilitated by a suggested easy method of charting the equation graphically. When once plotted, scores predicted for the criterion are easily calculated by simple addition and subtraction. These prediction scales will save most of the labor and much of the possible error in making predictions, since all multiplying of weights is eliminated by this suggested graphic method.

The historical development of multiple correlation is also sketched in this study, and there is an annotated bibliography of 218 items, covering statistical methods, correlation techniques, calculating methods, methods for solving linear equations, machine calculation, graphic calculating methods, and nomographs.

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PHILOLOGY

CONCORD OF NUMBER IN MODERN ENGLISH WITH SPECIAL REFERENCE TO THE INDEFINITES

Florence Gray Beall, Thesis (Ph.D.)
University of Michigan, 1933

In the number agreement of secondary words with those primary words which from one point of view indicate one and from another indicate several, the tendency of the language is for meaning to dominate form whenever meaning and form are in conflict. As early as the O.E. period, this language trend is evident in the number development of collective nouns and indefinite pronouns. They did not reach the final stage of number development, agreement with an immediately following plural verb, until the Middle English period when formal concord of number as a result of the loss of inflections became more and more limited in function. Many of the indefinites, however, particularly those which came into general usage during or after the Middle English period, have been slower than the collectives in reaching the final stage of number development. In fact some of the indefinites, words such as anybody, nobody, anyone, no one, in modern English are often used with plural verbs and reference pronouns but are not used with immediately following (or preceding) plural verbs. Possibly the adjustment of this type of indefinite to the meaning-concord pattern of the language has been delayed to some extent by the work of writers of grammars and rhetorics for use in the schools. Such writers have accepted the collective nouns as either singular or plural but have repudiated the usage of most of the indefinites in the plural. In present-

day spoken English anybody, no one, and similar indefinites are being used more frequently in plural constructions than in singular ones. They have reached the same stage of number development that the collectives reached before the Middle English period; they appear in agreement either with plural reference pronouns or with plural verbs if words or phrases intervene. If they follow the same course of development as that followed by the collectives, they will probably in time become completely adjusted to the meaning concord pattern and can be used with an immediately following plural verb.

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POLITICAL SCIENCE

COUNCIL-MANAGER GOVERNMENT IN KANSAS CITY

Henry Macmillan Alexander, Thesis (Ph.D.)
University of Missouri, 1934

A report based upon a study of municipal administration in Kansas City, Missouri, made in 1933-1934. The report seeks to appraise the effectiveness of municipal administration in Kansas City during the first eight years of council-manager government under the present charter adopted in 1926. In addition, the attempt is made to explain and account for conditions and results which the study revealed.

In the report's preparation recourse was had to published and unpublished reports of surveys and investigations undertaken by research agencies and by civic and professional organizations. An exhaustive bibliography lists these documentary source materials. Much information entering into the report was secured in interviews with present and past public officials, and with civic and political leaders. Moreover, considerable time was devoted to an observation of administrative practices and methods employed in the city's several governmental agencies. To appraise municipal administration in Kansas City under the council-manager plan, the report presents a comparison of administrative procedures and results under the present and under the former weak-mayor charter. In certain respects, the effectiveness of municipal administration under both the present and former charters is viewed in the light of results achieved in other cities.

Administration in Kansas City under the council-manager plan is shown to have been measurably

improved in particular phases of the city's activity. Fields in which the most notable improvement is reported are those in which the public interest and the partisan advantage of the city's dominant political organizations more nearly coincide. Material improvement is also indicated in particular phases of municipal service functions where possibilities of discrimination as between individuals and groups in rendering the service are for the most part eliminated. The report indicates that the centralization of authority which the council-manager charter introduced into the city's governmental framework has been utilized by the dominant political organizations to extend and strengthen its partisan control of the city's government.

The causes of maladministration in Kansas City are listed in terms of charter violations, but behind these proximate causes lies the more ultimate explanation to be found in the continued domination of the city's public affairs by political machines. Machine control was firmly entrenched in Kansas City at the time of the inauguration of council-manager government. This system of machine control was carried over into council-manager government, since no strongly organized effort was made in 1926 to make the spirit of the new charter effective. This lack of an organized citizen support to implement the non-partisan spirit of the charter is accounted for in the report in terms of conditions and circumstances that attended the campaigns in Kansas City seeking the establishment of a council-manager plan of municipal government.

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PSYCHOLOGY

SYMMETRY AND ASYMMETRY IN FORM ABSTRACTION BY CHILDREN

Charles H. Crudden, Thesis (Ph.D.)
University of Michigan, 1937

The purpose of this study is to examine the role of symmetry and asymmetry in the visual abstraction of meaningless geometrical forms by children.

Four series, each containing eight pairs of complicated figures in which a pair of simple closed symmetrical geometrical figures have been embedded, and four corresponding series, each containing eight pairs of complicated figures in which a pair of corresponding asymmetrical figures have been embedded, were presented to a total of 65 Ss. These Ss ranged from 65 to 78 months of age. S's specific task was to find the previously learned pairs of simple figures in each pair of complicated figures. Practice and transfer of training were equated by dividing the Ss into two groups and varying the order in which the symmetrical and asymmetrical series were presented to these groups. Examination of the results shows that:

1. Comparison of the mean number of errors made by all Ss in the symmetrical series with those made in the asymmetrical series shows that the asymmetrical are definitely more difficult to abstract.
2. Classification of the complicated figures from which the simple figures are abstracted according to the degree to which the simple figure is embedded in them shows that as the simple figure becomes more and more embedded the relative difference in abstraction difficulty between the

symmetrical and asymmetrical series becomes less and less.

3. Various factors other than symmetry and asymmetry such as accidental cues in figure construction, practice, and relative ease of differentiation of the positive and negative members of the symmetrical pairs of figures as compared to the asymmetrical pairs of figures which might influence the results are examined. These factors are found inadequate to explain the consistent differences in difficulty shown by our results.
4. Twelve different methods of distinguishing between the pairs of simple figures were found to be employed by the Ss. These were: general shape of the figures as a whole; one figure is pointed, the other is not; associations with familiar objects; differences in direction of curvature; relative width of the two figures as a whole; differences in size of angles; differences in number of horizontal lines; differences in total number of lines making up the figures; differences in the size of the figures as a whole; relative length of certain corresponding sides of the figures; differences in the number of "squares" in the two figures and differences in certain corresponding parts other than stated above. Ss frequently used more than one method rather than any one exclusively, both in one particular series and in all the series combined.

A dynamic theory would appear the best one to explain the results. A tentative explanation is proposed wherein abstraction consists of organizing a given set of stimuli into a figure-ground relationship. Successful abstraction results when those stimuli governed by the "Aufgabe" of S become "figure" and the remaining stimuli become "ground."

Reproductions of all the stimulus figures employed, together, with a detailed evaluation of these figures, are included in the manuscript.

Publication Number 99

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University Microfilms, Ann Arbor, Mich.

FORM DISCRIMINATION AS A LEARNING CUE
IN INFANTS

Bing-chung Ling, Thesis (Ph.D.)
University of Michigan, 1939

This experiment concerns genetic aspects of space perception and learning. Forty-four infants, six to twelve months old, were observed consecutively through several months. Their problem was learning to discriminate geometric form blocks, variable in position, number, size, pattern, orientation and function, but constant in color and distance. Qualitative and quantitative records (18,632 trials) include number of trials, percentage of success, reaction time, affective concomitants and oral, manual and visual behavior.

Results show much finer form discrimination ("abstraction") and learning ability than hitherto demonstrated; relative "independence" of form per se; negative correlation between learning and affective behavior; markedly plastic adaptation to reversed function, often with immediate "insight"; very consistent individual differences; the same "types" of learners as among adults.

Change in left-right position, orientation and size has little effect. More critical are: increased number (with complex juxtaposition), reversed functional relationship, sequence (order of difficulty) and maturational level. Angle forms are preferred to circle, and angle cues appear important. Tactual-oral manipulation apparently aids visual learning. No reliable "trace" effects occur in compound forms.

Relation of data to theories is discussed. One hundred and fourteen tables and figures are included.

Publication Number 98

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SOCIOLOGY

AN EDUCATIONAL SURVEY OF THE STATE INDUSTRIAL HOME FOR GIRLS IN MISSOURI AT CHILLICOTHE

Anna Verona Burns, Thesis (Ph.D.)
University of Missouri, 1935

This is a survey made in 1934-35 of the State Industrial Home for Girls at Chillicothe, Missouri, to find out what efforts have been made by the home to meet the needs of the girls who were sent there and to discover, if possible, further educational opportunities which might be needed. During the survey four other problems were considered. They were:

1. What were the influencing factors which may have caused the girls to become mal-adjusted?
2. What was the educational status of the girls upon entering the home?
3. What was the mental ability of the girls who were in the home?
4. What was the status of the mechanical ability of the girls?

The first division of the study was devoted to the historical development of the educational opportunities afforded the girls in the home to show the progress which has been made since the beginning of the institution and to show specifically the needs of the girls which were being met at the time the study was made.

The second division of the survey was made of 1772 girls to find out the general trend of the social and educational background of the girls upon

entrance and their achievements while in the home.

A third part of the study was devoted to the girls who were in the institution between November 1, 1934 and March 8, 1935, to obtain first-hand information from the girls which could not be obtained from record cards. These girls were studied from seven different standpoints: (1) their social background, (2) physical defects, (3) their interests, (4) their educational opportunities before coming to the institution, (5) their mental development, (6) their educational achievement, and (7) their mechanical ability.

The evidence gleaned from the survey seemed to warrant the following conclusions:

1. In re-educating the girls in the Industrial Home for Girls, efforts were being made to set up situations for the girls, such as those which they will meet in a well-organized community.
2. The institution had facilities for carrying on a fairly diversified educational program in vocational training, but it lagged considerably behind the more progressive city school systems in their facilities for providing academic training.
3. Although no final conclusion could be drawn as to the factors which have caused the girls to become maladjusted before coming to the institution, the facts found in the study showed, to some extent, wherein the school, the home, and society have failed to supply the fundamental needs in the girls' environment, and they indicated, to some extent, the problems which the institution has in re-educating the girls.
4. The educational problem was greatly complicated because the girls were being taught by mass instruction, and no provision for the girl to progress at a rate suited to her own intellectual ability was made.
5. Diversified recreational activities were recognized as being valuable in the institution, but they lack organization and leadership.

6. The high percentage of low intelligence among the girls created a very complicated educational problem in the Home.
7. If credence can be given the results of mechanical aptitude tests which measure one of the factors necessary for success in mechanical work, it was found that the greatest percentage of girls in the institution would be more proficient in those vocations which demand mechanical ability.

Publication Number 137

Microfilm copy of complete manuscript 150 pages
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THE SOCIAL PROBLEMS IN THE WRITINGS OF
RENÉ BAZIN

Nan E. Wade, Thesis (Ph.D.)
University of Missouri, 1938

This study, The Social Problems in the Writings of René Bazin, deals with a single problem and has a single aim, to show the definite sociological trend of Bazin's thinking as revealed through the use he made of social and economic problems as subject matter for his writings, both fiction and non-fiction. It was the aim of the author to determine all the social problems with which Bazin was concerned, establish the fact that they were vital problems in the France of his day, classify them, and discuss the use he made of them in his writings either per se or as background material.

In the pursuit of this objective the emphasis was placed on the importance of primary source material. The study was based on practically the entire literary output of Bazin, including novels, short stories, books of travel, essays, criticisms, biographies, and newspaper articles. However, all available secondary material was carefully examined.

In the introductory chapter Bazin's interest in, and his keen concern about real people and their problems of daily living are verified by concrete references to his work. He is shown as a product of the nineteenth century, a century which marks, as a result of both political and industrial revolutions, the coming of a transformed world. The growth, development, and results of a new social order were of such paramount interest to Bazin that his writings take on the nature of social history. His tendency to concern himself with social conditions in the contemporary world won for him the title, "apostle of social duty."

Each of the succeeding chapters illustrates

through references to specific works of Bazin the use this author makes of a definite social problem. The problems under discussion provide the titles for the chapters. These chapter headings in outline form accompanied by brief explanatory comment will give a general idea of the compass of this investigation.

- I. Rural Problems: the depletion of rural population by the exodus of young people from the rural sections to the urban centers and the related problems of the small landowner and tenant farmer.
- II. Influence of the Invention of Machinery: the invention of machinery and its attendant (1) displacement of men in industry and on the farm and (2) concentration of enterprises producing urbanization of population.
- III. Labor Problems: economic disturbances and complications arising from labor difficulties.
- IV. Problems Concerning Women: (1) women in gainful occupation outside the home, particularly with reference to the effect on family life and questions of morality; (2) the exploitation of woman.
- V. Population: the systematic depopulation of France.
- VI. The Instability of the Family: divorce, the violation of the sanctity of marriage, family life and the factors bringing about its disruption.
- VII. Assimilation: difficulties arising from lack of racial assimilation in the buffer states of Alsace and Lorraine.

The concluding chapter attempts a summary estimate of Bazin's writing. His own rules for writing are applied to his own work. When one compares his accomplishment with his purpose, it is noteworthy to see how well he carried out his plan. His theory that all literature with a social bent should be written not to reform but to form is evident in his fiction. The ethical implications never obscure the

plot. Although Bazin's readers may not agree with his theories concerning the cures for social evils, he does awaken in them a sense of social responsibility and has therefore made a definite contribution to society and social progress.

Publication Number 101

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AGRONOMY

Chemical and vegetative studies of magnesium availability in certain Pennsylvania soils. Willard Hershel Garman, Ph.D. Thesis; Pa. State Col., 1939. pp. 152, Pub. No. 115, (P.S.1939).

BACTERIOLOGY

The relation of bacterial activity to the disappearance of citric and malic acids in the bulk fermentation of tobacco. Donald Welcomer McKinsty, Ph.D. Thesis; Pa. State Col., 1939. pp. 42, Pub. No. 124, (P.S.1939).

BOTANY

Comparative physiology of actinomyces in relation to potato scab. Mitrofan M. Afanasiev, Ph.D. Thesis; Univ. of Nebraska, 1938. pp. 116, Pub. No. 55, (M.A.1938, No. 1).

Radiation and plant growth substance. Harold Ralph Clair McIlvaine, Ph.D. Thesis; Pa. State Col., 1939. pp. 55, Pub. No. 123, (P.S.1939).

Studies on the physiology and ecology of roots. Warren Wesley Nedrow, Ph.D. Thesis; Univ. of Nebraska, 1938. pp. 58, Pub. No. 53, (M.A.1938, No.1).

CERAMICS

The effect of various catalysts on the conversion of quartz to cristobalite and tridymite at high temperatures. Cho-Yuan Lin, Ph.D. Thesis; Pa. State Col., 1939. pp. 92, Pub. No. 122, (P.S.1939).

CHEMISTRY

A new chemical detector for molecular beams. Julian Glasser, Ph.D. Thesis; Pa. State Col., 1939. pp. 79, Pub. No. 116, (P.S.1939).

Electric conductivity and ion diffusion in glass. Harold Roth Vinyard, Ph.D. Thesis; Pa. State Col., 1938. pp. 44, Pub. No. 94, (P.S.1938).

The extraction and the chemical nature of lignin from prairie soil. Marcus D. Weldon, Ph.D. Thesis; Univ. of Nebraska, 1938. pp. 47, Pub. No. 57, (M.A.1938, No. 1).

Furan arsenicals. William Woolverton Beck, Ph.D. Thesis; Univ. of Nebraska, 1938. pp. 56, Pub. No. 58, (M.A.1938, No. 1).

CHEMISTRY

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